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SUMMARIES OF PRE-CAMBRIAN LITERATURE OF NORTH AMERICA

EDWARD STEIDTMANN
University of Wisconsin

III. QUEBEC

THE EASTERN PART OF CANADA, NEWFOUNDLAND, AND GREENLAND

Recent studies of the pre-Cambrian in Nova Scotia and Newfoundland have been of a reconnaissance nature and do not modify earlier stratigraphic studies in any important way. In northern Quebec, Cooke, Wilson, and Tanton have extended reconnaissance mapping to new areas. Moore has studied the Belcher Islands of James Bay and finds a series of slates, graywackes, quartzites, limestones, and sandstones similar to the Nastapoka and Richmond groups described by Leith and Low. In northern Quebec, the succession from the base upward includes mainly (1) basic lavas, ferruginous dolomites, iron formations, rhyolites, other volcanics of the Keewatin type, etc.; (2) crystalline limestones, etc., of the Grenville type; (3) intrusives of granite and granite gneiss. In western Quebec, Timiskaming County, rocks of the preceding type are unconformably overlain by conglomerates and other poorly sorted clastics. The youngest rocks are basic intrusives. The sections made do not all agree as to the relative position of the Grenville and Keewatin types.

Buddington¹ finds that the Algonkian rocks of southeastern Newfoundland include 16,000 feet of sediments intruded by granite, syenite, and gabbro, basic and acid dikes and flows. The sediments consist of green and purple cherty slate, volcanic conglomerate, and upper series 6,000 to 7,000 feet thick of red and green sandstones, conglomerates, and shales, containing fresh feldspars, cross-bedding, and intra-formational conglomerates. The upper sediments show evidence of continental origin.

¹ A. F. Buddington, "Reconnaissance of the Algonkian Rocks of Southeast Newfoundland" (Abstract), *Bull. Geol. Soc. Am.*, Vol. XXV, No. 1 (1914), p. 40.

Buddington¹ studies the petrography and origin of the pre-Cambrian rocks of Newfoundland.

Cooke² says that the underlying rocks of the region at the head waters of the Broadback River in northwestern Quebec include a complex of basic schists, which is overlain unconformably by sediments including mica quartz schists, quartzites, arkose, and conglomerate. The youngest rocks are intrusive granites.

Cooke³ states that the pre-Cambrian rocks of the northwestern part of Quebec are probably all pre-Huronian, using the latter term in the sense of the International Committee. The succession is as follows:

Mattagami series—In scattered patches

Unconformity

Nemenjish series—Seems to correspond to Grenville series farther south

Abitibi series—Basic lavas probably the equivalent of the Keewatin

Dresser⁴ reports on an area along the south shore of Lake St. John about 120 miles north of the city of Quebec. Here are notable outliers of Paleozoic rocks preserved by faulting. The pre-Cambrian rocks of the area include granites and anorthosite, the latter containing important titaniferous magnetic ores.

Faribault⁵ reports that the pre-Cambrian rocks of the Pleasant River Barrens, Lunenburg County, Nova Scotia, comprise the Goldenville quartzite which is overlain by the Halifax slates.

According to Faribault⁶ the pre-Cambrian rocks underlying the Port Mouton map area comprise the Goldenville quartzite

¹ A. F. Buddington, "Pre-Cambrian Rocks of Southeast Newfoundland," *Jour. Geol.*, Vol. XXVIII (1919), pp. 449-79.

² H. C. Cooke, "An Exploration of the Headwaters of the Broadback or Little Nottaway River, Northwestern Quebec," *Canada Geol. Surv. Summ. Rept. 1912* (1914), pp. 337-41, map.

³ H. C. Cooke, "Some Stratigraphic and Structural Features of the Pre-Cambrian of Northern Quebec," *Jour. Geol.*, Vol. XXVII (1919), pp. 65-78, 180-203, 263-75.

⁴ John A. Dresser, "Part of the District of Lake St. John, Quebec," *Canada Geol. Surv. Mem. No. 92* (1916), 88 pp., 5 pls., 2 figs., map.

⁵ E. R. Faribault, "Geology of the Gold District of Pleasant River Barrens, Lunenburg County, Nova Scotia," *Canada Geol. Surv. Summ. Rept. 1913* (1914), pp. 259-63, map.

⁶ E. R. Faribault, "Geology of the Port Mouton Map Area, Queens County, Nova Scotia," *Canada Geol. Surv. Summ. Rept. 1913* (1914), pp. 251-58.

18,348 feet in thickness and the Halifax slates 11,700 feet thick which overlie it.

Hovey¹ states that Archean gneisses appear on Parker Snow Bay, Greenland. They are overlain by Huronian quartzites, quartz schists, etc.

Malcolm² reports that the gold fields of Nova Scotia occupy the eastern half of the province bordering the coast. The oldest rocks are either Cambrian or pre-Cambrian sediments consisting of the Goldenville quartzites 16,000 feet thick conformably overlain by the Halifax slate 14,500 feet thick. Unconformably overlying them are Devonian or Carboniferous sediments. The quartzites and slates are thrown into folds having an east to west trend. Locally they are altered into gneisses and schists by a granite intrusion.

Moore³ finds over 9,000 feet of pre-Cambrian sediments on Belcher Islands about seventy miles from the south coast of Hudson Bay. These sediments resemble the Nastapoka and Richmond groups described by Leith and Low. The sediments include iron formation, concretionary limestone, and dolomite, various slates, some of which show marked banding, quartzites, graywackes, and sandstones. The iron formation consists of jaspilite, chert, cherty-iron carbonate, green granules probably iron silicate, hematite, magnetite, and shale. Diabase sills and basalt flows of uncertain age are associated with the sediments. Moore concludes from his study of the concretionary structures of the limestones and the granular structures of the iron formations that they were formed in part by algae and other lowly organism. The chief source of the iron solutions, he believes, was lateritic weathering.

¹ E. O. Hovey, "Notes on Geology of the Region of Parker Snow Bay," *Bull. Geol. Soc. Am.*, Vol. XXIX (1918), p. 98.

² Wyatt Malcolm, "Gold Fields of Nova Scotia," *Canada Geol. Surv. Mem. No. 20* (1912), 331 pp., 42 pls., 24 figs., 2 maps.

³ E. S. Moore, "The Iron Formation on Belcher Islands, Hudson Bay with Special Reference to Its Origin and Its Associated Algal Limestones," *Jour. Geol.*, Vol. XXVI (1918), pp. 412-38, 18 figs.

Tanton¹ maps and describes an area northeast of Lake Abitibi. His succession of pre-Cambrian rocks follows.

Post batholithic intrusives

Olivine diabase

Keweenawan

Quartz diabase, minette

Batholithic intrusives

Granite and granite gneiss

Laurentian

Igneous contact

Harricanaw series

Arkose, conglomerate, graywacke

Unconformity

Abitibi group

Ferruginous dolomites and iron formation rhyolites, basalt, other volcanics, etc.

The Kewagama Lake area described by Morley E. Wilson² includes about eighty square miles bordering on the Province of Ontario. Cobalt is about thirty miles south of the southwest corner of the area.

The region is a peneplain whose elevation above sea-level varies from 900 to 1,100 feet. The divide between the James basin and the St. Lawrence system crosses it along a sinuous east and west line. Many of the low hills and streams of the region are parallel with the rock structure, most of which trends north of east. Some of the streams and lakes, however, have a strikingly linear north and south direction. Wilson believes that they follow preglacial depressions.

The bed rocks are all pre-Cambrian. In many places they are covered by stratified and unstratified glacial deposits and by postglacial, finely stratified lake clays and sands. Wilson classifies the pre-Cambrian rocks into two main divisions, but refrains from correlating them with any of the units recognized by the International Committee.

The oldest division consists of highly metamorphosed and folded rocks intruded by batholiths of granite and granite gneiss.

¹ T. L. Tanton, "The Harricanaw Turgeon Basin, Northern Quebec," *Canada Geol. Surv. Mem. No. 109* (1919), 84 pp., 1 map, 9 pls., 2 figs.

² Morley E. Wilson, "Kewagama Lake Map Area, Quebec," *Canada Geol. Surv. Mem. No. 39* (1913), pp. 39-122, 24 pls., 9 figs., map in pocket.

The intrusive granites and granite gneisses resemble the Laurentian. They intrude the Abitibi group. The latter include a volcanic complex, consisting of amphibolites and schists, chloritic rocks, slate, and ferruginous dolomite; and the Pontiac series of fine-grained mica schists and gneiss, hornblende schist, amphibolite, arkose, graywacke, and conglomerate.

This old complex is beveled by a pre-Cambrian peneplain above which lies the Cobalt series. The contact is sharp in places; in others it is gradational. The Cobalt series consists of two tillite-like conglomerates separated by even-bedded graywacke, argillite, quartzite, and arkose. The conglomerates are believed by Wilson to be glacial because of their heterogeneous character, their great extent, the size of some of the constituent boulders, the distance of some of the boulders from the parent ledge, the soled and striated nature of some of the boulders, the improbability that the large boulders could have been deposited from checked torrential streams, since they rest on a peneplained surface on which streams must have had a low gradient. The stratified deposits separating the conglomerates are believed by him to be of interglacial, lacustrine origin.

The Cobalt series are intruded by a mass of syenite porphyry classed as doubtfully Keweenawan. Considered as doubtfully of the same age are certain diabase dikes which cut the old complex, but are not known to intrude the Cobalt series. They are called the Nipissing diabase because of their lithologic similarity to the Nipissing diabase of the Cobalt district.

Wilson¹ presents a map and report on Timiskaming County, Quebec. An outline of his classification of the pre-Cambrian rocks follows.

Keweenawan—Basic intrusives

Huronian—Cobalt series

 Conglomerate

 Arkose

 Graywacke and Argillite

Unconformity

¹ Morley E. Wilson, "Timiskaming County, Quebec," *Canada Geol. Surv. Mem.* No. 103 (1918), 196 pp., 1 map, 16 pls., 6 figs.

Basal complex

Pre-Huronian—Batholithic intrusions, granites, etc.

Abitibi group

Pontiac series—Sedimentary schists, iron formation, etc.

Igneous intrusives—Chiefly basic

Extrusives—Chiefly basic

Grenville series

Crystalline limestone, etc.

As in certain other recent papers by Wilson, he argues for a local nomenclature of the pre-Cambrian and against extensive correlations.

Wilson¹ reports that the succession of rocks underlying a part of Amherst Township of Quebec about 60 miles northeast of Ottawa, is as follows.

Late pre-Cambrian—A single diabase dike

Basal complex—

Batholithic granite and syenite gneiss

Buckingham series of intrusives—Gabbro, pyroxene, syenite, anorthosite

Grenville series—Limestone, garnet, gneiss and quartzite

Wilson² reports on a geological reconnaissance of a part of northwestern Quebec. The region includes a southern limestone belt, Grenville series, a northern sedimentary and volcanic belt (Abitibi group), and an intermediate belt of banded gneisses largely igneous intrusives into the Abitibi group. The Abitibi group includes schists, iron formations, and conglomerates which have not been stratigraphically separated.

Wilson³ concludes that the banded Laurentian gneisses are mostly of igneous origin and owe their banding to differentiation under deformative conditions, the latter causing fractures in the crystallized portions which become filled with magma.

¹ Morley E. Wilson, "Geology and Mineral Deposits of a Part of Amherst Township, Quebec." *Canada Geol. Surv. Mem. No. 113* (1919), 54 pp., 1 map, 17 pls., 3 figs.

² Morley E. Wilson, "A Geological Reconnaissance from Lake Kipawa via Grand Lake Victoria to Kawikawinika Island, Bell River, Quebec," *Canada Geol. Surv. Summ. Rept. 1912* (1914), pp. 315-36, fig.

³ Morley E. Wilson, "The Banded Gneisses of the Laurentian Highlands of Canada," *Am. Jour. Sci.*, 4th Ser., Vol. XXXVI (1914), pp. 109-22.

Wright¹ says that the pre-Carboniferous rocks of the Clyburn Valley, Cape Breton, consist of a bedded series of volcanics invaded by quartz diorite and granite batholiths and by sills and dikes of basic materials.

IV. MANITOBA, SASKATCHEWAN, AND NORTHWEST TERRITORIES

Alcock² has made a reconnaissance of the Lower Churchill River region of Manitoba and reports that the pre-Cambrian rocks of the area include the following:

Pre-Cambrian

Granite and gneiss	Biotite granite gneiss, hornblende granite gneiss, amphibolite, granodiorite, porphyritic granite
Churchill quartzite	Dominantly a dark gray, fine-grained quartzite
Keewatin	Local areas of chloritic and sericitic schists

Bruce³ has mapped and described the Amisk-Athapapuskow Lake area on the western border of the Canadian Shield on the boundary line between Saskatchewan and Manitoba. His succession follows:

	Kaminis granite Granite gneiss Hybrid granitic rocks
Intrusive contact	
Upper Missi series	Arkose Conglomerate
Unconformity	
Lower Missi series	Slate Graywacke Quartzite Conglomerate
Unconformity	
	Cliff Lake granite porphyry
Intrusive contact	
Kisseynew gneisses	
Amisk series	Sedimentary and igneous gneisses and schists, lavas, tuffs, agglomerates, and derived schists

¹ W. J. Wright, "Geology of Clyburn Valley, Cape Breton Island (Nova Scotia)," *Canada Geol. Surv. Summ. Rept.* 1913 (1914), pp. 270-83, map, diagram.

² F. J. Alcock, "Lower Churchill River Region, Manitoba," *Canada Geol. Surv. Summ. Rept.* 1915 (1916), pp. 133-36.

³ E. S. Bruce, "Amisk-Athapapuskow Lake District," *Canada Geol. Surv. Mem.* No. 105 (1918), 91 pp., map, 7 pls., 4 figs.

Camsell¹ reports on the results of a reconnaissance of a portion of the northwest territories between longitudes 108°30' to 114°30' and latitudes 58°30' to 61°30'. His classification of the pre-Cambrian rocks of the area follows.

Athabaska sandstone (sandstone and conglomerate)

Unconformity

Granite and gneiss

Intrusive contact

Tazin series (mica, chlorite, and quartz schists, slates and limestone)

Camsell and Malcolm² present a reconnaissance map and report of the Mackenzie River basin between longitude 100° to 135° and latitudes 55° to 68°. Pre-Cambrian rocks occur along the eastern border of the basin. Their classification of the succession follows.

Late pre-Cambrian Sandstone, limestone, and basic flows and intrusives

Unconformity

Granite and gneisses

Intrusive contact

Early pre-Cambrian Schists, slates, limestones, and quartzites

McInnes³ reports on a reconnaissance of 220,000 square miles lying between 91° to 106° longitude and 53° to 59° latitude. The area extends from Lake Winnipeg to Fort Churchill on Hudson Bay eastward to Prince Albert. The area is underlain chiefly by pre-Cambrian rocks excepting on the southwest corner, which is underlain by Cretaceous. Most of the pre-Cambrian rocks resemble the Laurentian of the Lake Superior region. In the eastern portion are found patches of the Keewatin and Grenville type. Sandstones like the Keweenawan of Lake Superior are abundant in the northwest part of the area. The classification of the pre-Cambrian by McInnes follows.

Keweenawan? Athabasca sandstone—White and dull red, coarsely granular, siliceous sandstone and conglomerate in thick, horizontal beds

¹ Charles Camsell, "An Exploration of the Tazin and Taltson Rivers, Northwest Territories," *Canada Geol. Surv. Mem. No. 84* (1916), 124 pp., 18 pls., 1 map.

² Charles Camsell and Wyatt Malcolm, "The Mackenzie River Basin," *Canada Geol. Surv. Mem. No. 108*, 154 pp., 1 map, 14 pls.

³ William McInnes, "The Basins of Nelson and Churchill Rivers," *Canada Geol. Surv. Mem. No. 30* (1913), 146 pp., 19 pls., 1 map.

Laurentian	Biotite granite gneiss, hornblende gneiss, amphibolite, granodiorite, etc.
Grenville?	
(Lac La Ronge series)	Quartz diorites, pyroxenites, amphibolites, gneisses, and schists, and crystalline limestones
Keewatin	Chloritic and hornblende schists, diorites, hornblendites, serpentines, etc.
Igneous	Granites, pegmatites, diorite, dikes, younger than Laurentian

The pre-Cambrian¹ rocks east of the south end of Lake Winnipeg are provisionally classified as:

Post Lower Huronian	Manigolagan granite, Pegmatite and gneiss
Huronian	Wanigow series; conglomerate containing quartz, rhyolite granite, felsite, greenstone, jasper, and chert, maximum diameter of pebbles 1 foot
Keewatin	Arkose, graywacke, chert, jasper, gray gneiss, and schist
	Rice Lake series; greenstone, quartz porphyry, rhyobite, trachyte felsite, green and gray schist

¹ E. S. Moore, "Region East of the South End of Lake Winnipeg (Manitoba)," *Canada Geol. Surv. Summ. Rept.* 1912 (1914), pp. 262-70, map.

[To be continued]